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VIDEO-POKER PLAY IN THE LABORATORY: THE EFFECT OF INFORMATION AND MONETARY VALUE ON RATES OF PLAY

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Previous research has found that participants will risk more credits across a video-poker session when they are required to play the optimal cards than when they have complete control over the game, a finding that would seem at least partially inconsistent with the illusion of control (Langer, 1975). Forty-two participants were recruited to play video poker in two sessions, one in which the game informed them of the optimal cards to play and one in which it did not. The session length for some participants was limited by time and for other participants by the number of hands played. Some of the participants played the game for money whereas others did not. When sessions were limited by time, the previous research results were replicated. However, when the sessions were limited by the number of hands played, no differences in gambling were observed between the two sessions. These results indicate that the effect of the game-provided information is to increase the speed at which people play, not to alter their gambling (i.e., betting). Implications of this finding are discussed.

Keywords: video poker, illusion of control, university students

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Among those who study gambling behavior and gambling problems, one of the more popular views that has been adopted for why individuals might display pathological gambling is because this disorder is perpetuated by cognitive fallacies held by the gambler (e.g., see Ladouceur, Sylvain, Boutin, & Doucet, 2002). One of the major fallacies is what is known as the illusion of control (Langer, 1975). Specifically, when an individual is actively involved in an activity, then that person tends to believe that his or her behavior in some ways controls the outcome of that activity even when the involvement has no bearing on the outcome. From a behavioral perspective, one could conceptualize the illusion of control as a form of stimulus control; adding certain features to the game in question inappropriately signals that the reinforcing contingencies have been altered.

Researchers and practitioners such as Ladouceur et al. (2002) have suggested that, because many gambling games require that the player become actively involved in the game (e.g., Blackjack, bingo), the games help promote the illusion of control. More recently, researchers (Myrseth, Brunborg, & Eidem, 2010) have suggested how strongly one subscribes to the illusion of control helps determine the games on which one chooses to gamble. Importantly, the study of the illusion of control is not limited to the understanding of pathological gambling. Research (e.g., Moore & Ohtsuka, 1999) has demonstrated that it is also related indices such as frequency of gambling among non-pathological gamblers.

A substantial amount of research on the illusion of control indicates that it occurs when people play games of chance. For instance,

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Wohl and Enzle (2002) demonstrated that participants who picked their own lottery tickets reported a higher perceived chance of winning than did participants who received computer-selected tickets. Davis, Sundahl, and Lesbo (2000) reported that casino gamblers betting on craps would bet larger sums of money on their own roll of the dice than on others' roll. In a laboratory situation, Dixon, Hayes, and Ebbs (1998) reported that some of their participants would pay extra chips to be able to select their own numbers when playing roulette versus having the researcher select the number for them.

Not all research results have been entirely consistent in finding the illusion of control, however. One example was provided by Dannewitz and Weatherly (2007), who had participants gamble on video poker in three different sessions. Across the sessions, the game was set up to provide the participants with no information as to which were the best cards to hold or discard, to provide information about which cards to hold/discard but the participants were not required to follow the advice, and to provide information about which cards to hold/discard and the participants had to play the identified cards. Dannewitz and Weatherly hypothesized that the illusion of control would be maximized when participants had complete control over the game and minimized when the computer dictated what cards would be played. Thus, they predicted that the greatest amount of gambling would be observed in the session in which participants had complete control over the cards. However, the observed results were in the opposite direction of this prediction; the amount of money participants gambled varied inversely with the level of control they had over the cards that were played.

One could argue that these results were inconsistent with the illusion of control. However, it is also possible that the results of Dannewitz and Weatherly (2007) represented an effect of response effort. That is, choosing one's own cards takes more time than not having to make a choice as to which cards to hold / discard. Consistent with this idea, Dannewitz and Weatherly also reported a similar effect for number of hands participants played across the three sessions. When looking at average bet per hand, no main effect of type of session was observed. However, there was a significant interaction between gender of the participant and the type of session. Thus, Dannewitz and Weatherly concluded that their data more likely represented a rate-of-play effect rather than arguing against the illusion of control (Langer, 1975), but that their results could not definitively address the issue. Doing so was the goal of the present study.

For the present study, 48 participants were recruited to play in two video-poker sessions. In one session, they received no information about what cards to hold / discard. In the other, the computer identified the cards to hold / discard and the participants were instructed that they had to play those cards. Half of the participants played in each of these sessions for up to 15 minutes. The other half of the participants played a maximum of 50 hands in each type of session. If the results reported by Dannewitz and Weatherly (2007) were the outcome of the rate of play, then their results should be replicated in the present study when participants were allowed to play up to 15 minutes per session, but not when the number of hands was equalized between the two sessions. Our hypothesis was that no differences in gambling behavior would be observed between the sessions when controlling for the number of hands participants could play.

Also, because research has demonstrated that results from laboratory-based experiments on gambling may differ as a function of whether participants risk actual money (Peterson & Weatherly, 2011; Weatherly & Brandt, 2004; Weatherly & Meier, 2007), half of the participants played in these sessions for credits that were worth money while the other half

were instructed to play "as if" the credits were worth money. Because the participants in the Dannewitz and Weatherly (2007) study risked actual money, we predicted that their results would be replicated in the present study when participants were risking credits with monetary value. However, we were interested in determining whether eliminating the monetary value of the credits would mask any influence of whether or not the participants were allowed to choose their own cards.

METHOD

Participants

The participants were 48 students (21 male; 27 female) enrolled at the University of North Dakota. All participants were 21 years of age or older, with the mean age of the participants being 23.6 years (*SD* = 3.8 years). The sample was racially homogeneous, with 39 of the 48 participants (81.3%) self-reporting as Caucasian, which could potentially impact the implications of the results given that ethnicity is a major risk factor for pathological gambling (Petry, 2005). Participants received (extra) course credit for their participation.

Materials and Apparatus

The research was conducted in a room that measured approximately 1.5 X 4.0 m. The room contained a desk, chair, and file cabinet. A desktop computer, equipped with two monitors, was located on the desk. The dual monitors allowed the researchers to conduct both poker sessions consecutively (i.e., not stopping the experiment to record data and resetting the video poker game). The computer was equipped with WinPoker 6.0 (see Jackson, 2007).

The first of three materials was an informed-consent form that outlined the experiment as approved by the Institutional Review Board at the University of North Dakota. The second was a demographic form that asked about information reported in the participants section. The third was the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987). The SOGS is the most widely used diagnostic screening tool for pathological gambling, with a score of five or more on the SOGS indicating the potential presence of pathological gambling. Research on the SOGS indicates that it is internally (Lesieur & Blume, 1987; Stinchfield, 2002) and temporally reliable (Lesieur & Blume, 1987; Poulin, 2002). Participants who scored five or more on the SOGS were not allowed to participate so as to ensure that potentially pathological individuals did not engage in their pathology. One potential participant scored above five on the SOGS and was replaced.

Procedure

Participants were randomly placed in one of four groups. All participants played in two video-poker sessions. Half of the participants played for a maximum of 50 hands in each session (50H) while the other half played for a maximum of 15 minutes (15min) in each session. Likewise, half of the participants gambled credits that were worth money ($$) while half played for credits that were not worth money (Not). Thus the four groups were 50H-$$, 50H-Not, 15min-$$, and 15min-Not. Twelve participants were assigned to each group.

For each participant, the session started with the researcher checking the participant's identification to ensure the participant was 21 years of age or older. The researcher then went through the process of obtaining informed consent from the participant. Once consent was obtained, the participant completed the demographic form and the SOGS. The researcher then checked the SOGS to ensure that the participant did not score five or more. At that point, the participant was seated in front of the computer monitors (only one of which was on in any one poker session). The researcher then read the participant the following instructions:

> You will now be given the opportunity to play a computer generated, five-card-draw poker game. You will be staked with 100 credits. Each credit is worth 5 cents. Thus, you are being staked with $5.* You may bet up to five credits per play and your goal should be to end the session with as many credits as you can. How you play the game is up to you.‡ You may quit (i.e., end the session) at any time by informing the researcher that you wish to end the session. The session will end when a) you quit playing, b) you reach 0 credits, or c) you have played 50 hands.† You will be paid in cash at the end of today's session for the number of credits you have accumulated or have remaining.* Do you have any questions?

If the participant had questions, the researcher answered them by repeating the above instructions. These instructions were read to the participants in the 50H-$$ group. For participants in the 50H-Not group, the first sentence in the instructions followed by the "*" was replaced with "We ask that you treat these credits as if they had monetary value." The second sentence followed by the "*" was removed altogether. For participants in the 15min-$$ group, the sentence in the instructions followed by "†" was replaced with "The session will end when a) you quit playing, b) you reach 0 credits, or c) you have played for 15 minutes." For participants in the 15min-Not group, all three changes were made to the instructions.

The participants played in two video-poker sessions. In both sessions, the participant played the game "Loose Deuces," which is a five-card-draw game in which "2s" are wild. This particular game was chosen for use because research (Weatherly, Austin, & Farwell, 2007) has demonstrated that participants typically play this game poorly (i.e., they hold / discard cards that vary from the ideal) and the goal was to maximize differences in play between the free-play and autohold sessions. In one of the poker sessions, the participant played the game without any input from the game (i.e., the game did not indicate which of the cards should be held / discarded; free play). The above instructions pertain to this type of session. In the other session, the game indicated the cards that should be held / discarded (autohold). Prior to participating in this session, the above instructions were reread to the participant with the exception that the sentence followed by the "‡" was replaced with the sentence "The game will show you which cards should be held and discarded each hand and you are required to play those cards." The order of the free play and autohold sessions were counterbalanced across participants.

After participants had completed both video-poker sessions, they were debriefed, paid (if they were in one of the $$ groups), given their (extra) course credit, and dismissed.

Design

There were three main dependent variables of interest. The first was the number of hands played per session, which can be interpreted as a measure of persistence. The second was the number of credits bet across the session, which can be interpreted as a measure of risk. Although number of hands played and number of credits bet will be positively correlated, participants could bet between one and five credits per hand. Thus, the correlation will not necessarily be 1.0 unless each participant bet the same number of credits every hand. The third dependent variable was the percentage of hands in which the participants played optimally (i.e., played the cards that maximized their rate of return), which can be interpreted as a measure of accuracy.

Each of these dependent measures was subjected to a three-way (Hand Limit X Credit

Value X Type of Session) mixed-model analysis of variance (ANOVA). In each ANOVA, hand limit (i.e., 50 hands vs. 15 minutes) and credit value (i.e., worth money vs. no monetary value) served as between-subject factors and type of session (i.e., free play vs. autohold) was a repeated measure. Results from all analyses were considered significant at $p \leq .05$.

RESULTS

Either by mistake or in opposition to the directions, 15 of the 48 participants did not play the cards denoted by the game in the autohold session on at least one hand during that session. Because not playing the designated cards made the autohold session equivalent to the free-play session, participants who played the autohold session at less than 90% correct were removed from the data analyses. This criterion led to the elimination of six participants. The final number of participants in the 50H-$$, 50H-Not, 15min-$$, and 15min-Not groups was 11, 10, 12, and 9, respectively.

Despite the removal of the data from these participants, the analysis of the percentage of correct plays indicated that the manipulation of free play vs. autohold was effective in altering participants' accuracy. The main effect of type of session was significant, $F(1, 38) = 288.32$, $p < .001$, $\eta^2 = .884$, indicating that participants played significantly less accurately in the free-play session (Mean = 53.95% correct; $SD = 17.22\%$) than in the autohold session (Mean = 99.32% correct; $SD = 1.88\%$). The main effects of hand limit, $F(1, 38) = 1.09$, $p = .303$, $\eta^2 = .028$, and of credit value, $F(1, 38) < 1$, $\eta^2 = .003$, were not significant. Furthermore, none of the potential interactions were significant, all Fs$(1, 38) < 1.65$, ps $> .206$, η^2s $< .042$.

Although not all participants in the 50H groups played 50 hands per session, limiting the number of hands was effective in equalizing the number of hands between the two poker sessions for the 50H groups. When number of hands per session were analyzed, the main effect of type of session was significant, $F(1, 38) = 4.91$, $p = .033$, $\eta^2 = .114$, indicating that participants did play more hands in the autohold session than in the free-play session. However, the main effect of hand limit, $F(1, 38) = 40.85$, $p < .001$, $\eta^2 = .518$, and the interaction between type of session and hand limit, $F(1, 38) = 4.18$, $p = .048$, $\eta^2 = .099$, were both significant. No other main effects or interactions reached statistical significance, all Fs$(1, 38) < 2.11$, ps $> .155$, η^2s $< .053$.

Because of the significant interaction, tests for simple effects were performed. Results showed that participants in the 15min groups played significantly more hands than participants in the 50H groups in both the free-play, $F(1, 40) = 12.22$, $p = .001$, $\eta^2 = .234$, and autohold sessions, $F(1, 40) = 29.35$, $p < .001$, $\eta^2 = .423$. Participants in the 15min groups played significantly more hands in the autohold session than in the free-play session, $F(1, 20) = 4.73$, $p = .042$, $\eta^2 = .191$, a finding that replicated the results reported by Dannewitz and Weatherly (2007). Participants in the 50H groups, however, did not play a significantly different number of hands in the free-play and autohold sessions, $F(1, 20) < 1$, $\eta^2 = .006$. These results are depicted in the top graph of Figure 1.

Similar results were observed for the number of credits bet across each session. In this analysis, the main effect of type of session was significant, $F(1, 38) = 6.34$, $p = .016$, $\eta^2 = .143$, indicating that more credits were bet in the free-play session than in the autohold session. Again, however, the main effect of hand limit, $F(1, 38) = 12.85$, $p = .001$, $\eta^2 = .253$, and the interaction between type of session and hand limit, $F(1, 38) = 7.15$, $p = .011$, $\eta^2 = .158$, were both significant. All other effects and interactions were not statistically significant, Fs < 1, η^2s $< .022$.

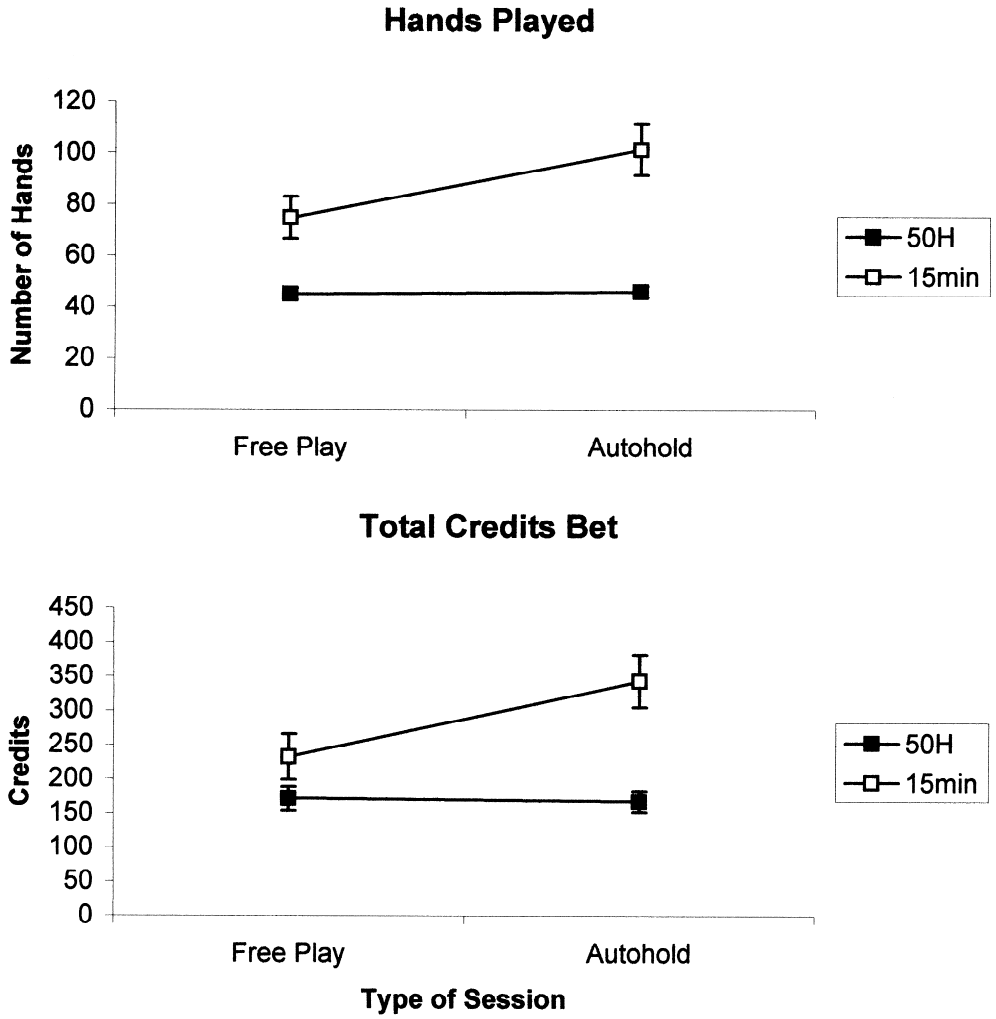

Figure 1. Presented are the number of hands played (top graph) and total number of credits bet (bottom graph) in the free-play and autohold sessions for participants whose sessions were limited by the number of hands that could be played (50H; closed squares) or by time (15min; open squares).

Because of the significant interaction, tests for simple effects were performed. Results showed that participants in the 15min groups bet significantly more credits than participants in the 50H groups in the authohold session, $F(1, 40) = 18.09$, $p < .001$, $\eta^2 = .311$, but the difference did not reach statistical significance for the free-play session, $F(1, 40) = 2.67$, $p = .110$, $\eta^2 = .063$. Participants in the 15min groups bet significantly more credits in the autohold session than in the free-play session, $F(1, 20) = 7.26$, $p = .014$, $\eta^2 = .266$, which again replicated the results reported by Dannewitz and Weatherly (2007). As with number of hands played, participants in the 50H groups did not bet a significantly different number of credits in the free-play and autohold sessions, $F(1, 20) < 1$, $\eta^2 = .003$. The results for number of credits bet are presented in the bottom graph of Figure 1.

DISCUSSION

Dannewitz and Weatherly (2007) reported results that were potentially in opposition to the illusion of control (Langer, 1975) in that participants gambled more on video poker under conditions in which they were less involved in the game than when they were more involved. The present experiment was designed to determine whether this result was the outcome of an increase in the rate of play rather than a failure to observe the illusion of control. The present results replicated those of Dannewitz and Weatherly (2007) when participants were allowed to play as many hands of video poker as possible during 15-minute sessions. However, when the number of hands that could be played per session was limited regardless of whether the participants had complete control over the cards they played or the game indicated the cards that should/would be played, differences in gambling behavior were not observed. This latter finding strongly supports the idea that the results of Dannewitz and Weatherly (2007) were the outcome of an increase in the rate of play.

Although the present results help explain why people might gamble more on video poker when the game indicates the optimal cards that should be played, it should be noted that both the present results and those of Dannewitz and Weatherly (2007) still failed to produce the illusion of control (Langer, 1975). The illusion of control should appear as participants become increasingly involved in the game. In the current procedure, and that of Dannewitz and Weatherly (2007), that appearance should have been observed as more gambling in the free-play sessions than in the autohold sessions. The present results indicate, however, that when one controls for the number of hands played, no differences in gambling between these two types of session were observed. Unarguably, this result is not the opposite of the illusion of control. But it is not a demonstration of the illusion of control either. Further research will be needed to determine what factors related to the present procedure inhibited the illusion of control from being observed.

With that said, it could be argued that the fact that 15 of the participants did not on at least one occasion follow the advice of the game in the autohold session, which was both in their best interest because the advice maximized their return and had been specifically instructed, demonstrates the presence of the illusion of control. Again, it is not known exactly why these participants failed to do so, but it is possible that making their own choice potentially (and inaccurately) signaled that the probability of reinforcement had been increased. Future research should investigate the contingencies that are maintaining the participants' behavior in these situations.

A second independent variable investigated in the present study was whether or not participants' behavior would be altered by whether or not they were risking actual money. Although several past studies have reported finding that participants who risk actual money gamble more conservatively than participants who are asked to gamble "as if" they were risking money (Weatherly & Brandt, 2004; Weatherly & Meier, 2007), the present manipulation did not produce significant difference in video-poker play. Several reasons might account for this failure. One might be the power of the design. That is, participants who played for credits that were worth money risked, on average, 273.88 credits per session. On the other hand, participants who played "as if" their credits were worth money risked, on average, 307.11 credits per session. Although this difference did not reach statistical significance, it should not be dismissed as unimportant manipulation. This difference of 33 credits per session equates to $1.66 per session, which is the equivalent to one third of the money that the participants who played for actual money were originally staked. A second reason may lie with the participants

themselves. Peterson and Weatherly (2011) demonstrated that whether or not participants played video poker differently as a function of whether they were playing for something tangible (i.e., money) depended on the participants' financial status. Those participants with higher incomes tended to play similarly regardless of the consequences, whereas participants with lower incomes tended to play more conservatively when playing for tangible outcomes than when playing "as if" they were gambling money. Because the present procedure did not measure participants' annual incomes, it is not known whether a similar outcome would have been observed.

The major impact of the present research may be to warn against the benefits of the autohold function on video-poker machines that are found in actual casinos. States such as Louisiana, for instance, have required establishments housing video-poker machines to have this feature on their machines. The seemingly reasonable reason for doing so is that the autohold feature will help ensure that the gambler does not mistakenly play the game at a suboptimal level. The present results in fact support the idea that players, left to their own devices, will do just that (i.e., the present participants played at only 54% of optimal in the free-play sessions, but at 99% of optimal in the autohold sessions). However, this difference did not change the participants' gambling behavior. That is, despite their increased chances in the autohold session, participants bet similarly to the free-play session. The elimination of six participants from the present study also suggests that, even when people are provided with accurate information on the best cards to play, they will sometimes ignore it. Together, these results suggest that requiring video-poker operators to install the autohold function on their machines may not result in the intended benefit. Indeed, if the autohold function serves only to increase the rate of play, then the ultimate result may be the opposite of that which was intended.

It is quite likely, however, that the present results only apply to video poker. Phrased differently, video poker is unique in that there is an autohold function that could be employed. Games like slot machines or roulette do not have such options. Likewise, these other games tend to maximize decision-making by the gambler (e.g., what denomination of coins to play, how many lines on the slot machines to bet on, what numbers to choose on the roulette table, etc.), which in turn potentially maximize the illusion of control. Future research on the illusion of control should investigate whether similar contingencies are working across the different games or whether the stimulus control that is potentially accounting for the illusion of control varies from game to game. Likewise, it would also be important to determine whether any such differences might also vary between populations (e.g., pathological vs. non-pathological gamblers).

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